States. During the 25th and 26th pressure was very low over the Atlantic States, with minimum readings about 28.90 inches from northern Virginia to southern New England on the 25th. Following this depression snow fell as far south as eastern Tennessee, and frost occurred the morning of the 26th in the middle and east Gulf and South Atlantic States. During the closing days of March kite flights at Mount Weather, Va., showed unusually low temperatures at an altitude of about 1 mile. On the 30th the temperature gradient to that height was 26° and on the 31st it was 22°, the average gradient being about 15°. The presistent cloudiness of this period in the Middle Atlantic States may be attributed to the unusually low temperature of the upper air that overlaid that region.

BOSTON FORECAST DISTRICT.*

[New England.]

The weather, generally speaking, was that of the average March. Snowfall was heavy in northern and moderate to light over other portions of the district. At the close of the month snow was 3 or 4 feet deep in the woods and mountains of the northern sections. The only severe storm was that of the 25–26th during which gales of great force swept the entire coast. During the storm a number of schooners and smaller craft were driven ashore, and some damage was caused to shore property. Warnings were issued well in advance of the gale and were of great benefit. Relative to the warnings the Boston Herald remarked as follows: "The storm warnings signaled from Cape Hatteras to Eastport saved many skippers from the gales which piled up the roughest sea that has run on the Atlantic coast in many years."

There were no storms during the month without warnings.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.*

[Louisiana, Texas, Oklahoma, and Arkansas.]

There was an excess in temperature and a deficiency in precipitation throughout the greater part of the district. Warnings were issued for all severe weather conditions that occurred during the month.—*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.*

[Kentucky and Tennessee.]

Temperature and precipitation averaged about normal. The coldest weather occurred about the middle of the month, and the principal rain periods were the 5–6th and 8–9th when there was considerable flooding in the streams and over the lowlands.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT.*

[Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, and Montana.]

There were no unusual weather features in the district during the month. No cold-wave warnings were issued and no severe gales occurred on Lake Michigan.—*H. J. Cox, Professor and District Forecaster.*

DENVER FORECAST DISTRICT.*

[Wyoming, Colorado, Utah, New Mexico, and Arizona.]

The lowest temperatures of the month were recorded from the 8th to 15th. In southeastern Wyoming and in the north-central counties of Colorada the snowfall of the month was unusually heavy.—*P. McDonough, Local Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.†

[California and Nevada.]

The month was in most respects a typical March month. The number of barometric disturbances was below the average. In the central portion of California the average number of rainy days was thirteen, or three days more than normal. No frost warnings were issued.—*Alexander G. McAdie, Professor of Meteorology.*

PORTLAND, OREG., FORECAST DISTRICT.†

[Oregon, Washington, and Idaho.]

Although stormy weather prevailed during the opening and closing days the month on the whole was unusually quiet. Precipitation was below and temperature slightly above normal. There were many frosty mornings, but no cold spells worthy of note. Snow in the mountains at the end of the month was deeper than usual, while that on the southern slopes thawed so slowly that none of the rivers reached a flood stage.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

At the end of February, 1909, the Ohio River was above flood stage from Maysville, Ky., to the mouth of the Tennesee River, with the crest of the flood nearing Evansville, Ind. The flood stage of 45 feet was reached at Cairo, Ill., on March 2, and from that day until March 22, inclusive, the river remained above the flood stage below the mouth of the Tennessee River. The crest stage of 47.3 feet was reached at Cairo on the 17th. In the lower Mississippi River flood crests and dates thereof were as follows:

Station.	Crest stage.	Flood stage.	Date.
	Feet.	*Feet.*	
New Madrid, Mo	38.6	34	March 18
Memphis, Tenn	38.6	33	March 22
Helena, Ark	47.7	42	March 25
Arkansas City, Ark	50.1	42	March 28–30
Greenville, Miss	44.8	42	March 29, 30
Vicksburg, Miss	48.1	45	April 2, 3
New Orleans, La	17.9	18	April 3

Owing to the excellent condition of the levees, and to the warning given to remove property, etc., from unprotected land, the Mississippi flood passed off without unusual incident, and almost entirely without losses or damage. The flood was a rapid one and in the Memphis district there was very little delay in farm work. The completion of the levee in front of Reelfoot Basin, Tenn., has disturbed the gage relations previously existing at all places between Cairo and Memphis, and the following interesting statement on the subject was prepared by Mr. S. C. Emery, Official in charge, Local Office of the Weather Bureau at Memphis, Tenn.

* * * * * * *

As this was the first high water that has occurred since the completion of the levee in front of the Reelfoot Basin, it is of special interest to note its effect on gages below Cairo, Ill. Heretofore, whenever the river at Cairo reached a stage of 38 feet, or 29 feet at New Madrid, Mo., the water began to flow out to the Reelfoot Basin, in which, during flood periods, a large amount of water was stored. In this way a considerable portion of the water passing Cairo did not reach New Madrid, but passed around that point and a portion reentered the Mississippi several miles below New Madrid near Fulton, Tenn. Since 1907 a levee has been constructed from near Hickman, Ky., to the high bluffs above Tiptonville, Tenn., its purpose being to keep the Mississippi water in flood time from flowing over the low banks in that section into the Reelfoot district. By forcing the water to pass New Madrid the flood plane at that place has been increased about 2½ feet, that is, instead of a difference between Cairo and New Madrid of 11 feet as shown during former periods of high water, it is now seen that this difference has been reduced to less than 9 feet and in extreme high water the difference is expected to be still less. The effect of closing the Reelfoot Basin appears also to have raised the flood plane at Memphis, Tenn. In former years the difference in the gages at Cairo and Memphis has been 10 feet or more. In 1907 when the extreme stage was 40.3 feet the difference in crest stages at Cairo and Memphis was 10.6 feet, while in the present rise the difference is only 8.7 feet and it seems probable that when higher levels are reached this difference will be close to 8 feet. At Helena, Ark., there seems to be little or no change in the gage relation with either Cairo or Memphis, the difference still being approximately 10 feet.

Along the lower Ohio River conditions were not so favorable. Bottom lands were overflowed for a considerable period of time and much inconvenience resulted, especially to those who were driven from their homes, but the actual damage was small.

There were moderate floods in the White River of Arkansas at various times from March 8 to 22, inclusive, for which

* Morning forecasts made at district center, night forecasts made at Washington, D. C.

† Morning and night forecasts made at district center.

warnings were issued at the proper time. Some inconvenience resulted, but the damage was insignificant.

Heavy rains at various times from the 9th to the 13th, inclusive, over Georgia and Alabama were followed by general floods in those States. The floods in Georgia, however, were not serious, although flood stages were general over the central and western portions of the State. Conditions were probably most pronounced along the Chattahoochee River where considerable damage of the usual character was done. At Columbus mills were obliged to close.

In the State of Alabama the rains were much heavier than in Georgia, and conditions much more serious. Warnings were first issued over the Alabama watershed on the 10th, with supplementary warnings on the 11th and 12th that the floods would be the highest of recent years, probably passing the 50-foot stage in the Alabama and extreme lower Coosa rivers.

Five lives were lost at Montgomery, and property along the river to the value of $450,000. It is estimated that the losses in live stock alone amounted to $200,000. The value of the property saved by the warnings about equaled the losses, although more of the latter may yet be reported, as several thousands of acres of oats were under water and may have been killed.

The warnings were of the greatest benefit to all classes, and those who were in a proper position to appreciate their value, have made frequent acknowledgment of the same.

The flood in the Black Warrior and lower Tombigbee rivers was as pronounced as that in the Alabama River, but the losses were trifling as a whole. The high waters were a distinct benefit to the lumber interests as they permitted the movement of logs to the value of $200,000. The value of the property saved through the Weather Bureau warnings was above $200,000, representing principally cattle and lumber in the lowlands.

The crest and flood stages in the Alabama, Black Warrior, and Tombigbee rivers were as follows:

Station.	Crest stage.	Flood stage.
	Feet.	*Feet.*
Montgomery, Ala.	51.7	35
Selma, Ala.	52.9	35
Tuscaloosa, Ala.	61.3	43
Demopolis, Ala.	61.5	35

The flood in the Pascagoula watershed of Mississippi was much more moderate, and the total losses did not exceed $15,000. The value of property saved by the warnings was also about $15,000.

Nothing of special interest occurred on other rivers.

ICE.

The Missouri River at Pierre, S. Dak., opened at 4 p. m. of the 6th, and after that date practically the entire river was open. The Red River of the North opened at Moorhead, Minn., on the 18th.

The Mississippi River remained frozen throughout the month at Fort Ripley, Minn. The ice moved out at St. Paul, Minn., on the 15th, at Red Wing, Minn., on the 23d, and at La Crosse, Wis., on the 31st. The river remained closed at Prarie du Chien, Wis., but at Dubuque, Iowa, it opened on the 21st. Farther down the river was open, although floating ice was observed at Le Claire, Iowa, as late as the 19th.

The rivers of Maine remain frozen, but the Connecticut opened at Bellows Falls, Vt., on the 11th and at Whiteriver Junction, Vt., on the 26th, remaining closed above the latter place.

The highest and lowest water, mean stage, and monthly range at 204 river stations are given in Table VI. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor of Meteorology.*

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

A CHRONOLOGICAL OUTLINE OF THE HISTORY OF METEOROLOGY IN THE UNITED STATES OF NORTH AMERICA.

This outline of the history of meteorology in the United States of North America has been prepared to meet a somewhat general demand for the information it contains. The contents represent the combined judgments of the members of the Washington staff of the United States Weather Bureau, and the Editor wishes to acknowledge the generous cooperation of all his colleagues.

While the choice of events to be regarded as important milestones in the history of the science of meteorology must be in part a matter of individual judgment, it is nevertheless possible to be uniformly correct in the facts stated and the dates given. This compilation aims at this ideal. It is hoped that at a later date this historical chronology of the science of meteorology may be supplemented by a chronological list of the more important meteorological phenomena of North America.—*C. A.*

1644–45. As far as known the first regular record of the weather on the American Continent was kept by the Rev. John Campanius at the Swedes' Fort, near Wilmington, Del.

1723. Prof. Isaac Greenwood, of Harvard College, recommended to the Royal Society of London a form for marine meteorological records.

1727–1738. First course of lectures on meteorology at Harvard College, by Prof. Isaac Greenwood.

1729–30. A regular weather record was kept at Boston, Mass., by Hon. Paul Dudley, Chief Justice of Massachusetts.

1730. Dr. John Lining began thermometer records at Charleston, S. C., using a Fahrenheit thermometer made in England and standardized there.

1738–1750. Regular meteorological observations were made at Charleston, S. C., by Dr. John Lining. These included Fahrenheit and other thermometers, the barometer, and the hygroscope.

1739. Benjamin Franklin (*b.* January 17, 1706, *d.* April 17, 1790) on his homeward voyage from England kept records of the weather and water temperatures, using an English Fahrenheit thermometer, and suggested a method of determining the approach of vessels to the American coast by the temperature of the water.

1739–1765. A regular course of lectures on meteorology delivered annually at Harvard College by Prof. John Winthrop.

1742–1778. Regular meteorological records were kept at Cambridge, Mass., by Prof. John Winthrop of Harvard College. He used a Hawksbee thermometer until 1763 and then a Fahrenheit.

1743. In September Benjamin Franklin, then Postmaster General, from the reports of numerous postmasters and from the fact that at Philadelphia, Pa., a storm prevented observations of an eclipse of the moon, while at Boston, Mass., the eclipse was over an hour before the storm began, deduced the progressive movement of a hurricane storm moving up from the West Indies. This is the first recorded instance in which the progressive movement of our storms as a whole was recognized.

1747. Publication at Philadelphia, Pa., of Lewis Evans's map, containing Franklin's rule "that all great storms begin